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Correlated multi-messenger signals from the landscape of core-collapse supernovae

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With the advent of modern neutrino and gravitational wave detectors, the promise of multi-messenger detections of the next galactic core-collapse supernova has become a certainty. These detections will give insight into more than just the core-collapse supernova mechanism: they may resolve longstanding questions about the structure of the progenitor star and fundamental neutrino physics. Using 1D CCSN simulations, I have explored multi-messenger neutrino and gravitational wave signals from the landscape of CCSN progenitors from 9-120 $M_{\odot}$. I have found that, with a joint detection of neutrino and gravitational waves, it may be possible to use correlations between the signals to determine information about the progenitor structure, explosion mechanism, and fundamental neutrino physics such as the mass hierarchy.

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